Behavioral Changes in Dolphins in a Strange Environment

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In recent years, dolphins of three species have been conditioned to respond to acoustic signals and perform reliably while swimming untethered in the open sea (Bailey, 1965; Norris, 1965; Hall, 1970).

This report describes abrupt and radical changes which were observed in 10 dolphins, eight *Tursiops truncatus* and two *Lagenorhynchus obliquidens*, at the Marine Bioscience Facility, Point Mugu, California, when they were moved from concrete tanks to net pens in turbid waters of Mugu Lagoon prior to their initial open sea release. It also notes four separate instances where animals wandered away from the pen area and behaved in a manner inconsistent with previous conditioned responses.

The dolphins had been in captivity for periods ranging from three weeks to three years prior to commencement of conditioning. Only one had previously been conditioned for another experiment.

Preparatory to open sea release, all were trained to (1) come to and touch an acoustic "recall" signal when it was placed in the water at any point around the perimeter of the tank, (2) swim through gates to adjacent pens whenever the recall signal was placed in the water at the gate, and (3) allow themselves to be handled over all parts of the body by persons in the water or at the side of the tank. Usually 2-4 months were required to establish these responses. Once a dolphin would perform all the required behaviors promptly and consistently, it was considered ready for the final phase of training prior to open ocean release. During this phase, it was released into the ocean-fed lagoon adjacent to the Facility.

The training area in Mugu Lagoon is approximately 600 meters square with an average depth of 3-6 meters at low tide (see Fig. 1). A mud bottom and insufficient water exchange through a narrow channel to the ocean usually reduce underwater visibility to less than 60 centimeters. Background noise levels in the lagoon, produced by a variety of organisms, snapping shrimp, mussels, croakers, etc. vary with the time of day and the tide. The overall sound pressure levels, as measured with an AN/DQM-1A underwater sound level meter, range between 0-10 dB (re: 1 microbar).

The measurements cover a band from 40 Hz-40 kHz; however, most of the ambient in the lagoon is below 1 kHz.

During lagoon training, animals were maintained in a series of floating pens constructed of steel torpedo netting hung from interconnected steel pontoons. Behavior patterns learned in the concrete tanks were re-established, first in 4 × 6 meter pens, and then in a 17 × 19 meter enclosure connected with each small pen by an opening 120 cm wide by 150 cm deep. The depth of the large enclosure was between 2-4 meters, varying with the tide.

When a dolphin in the lagoon pens performed at the levels established in the concrete tanks, it was released into the open lagoon for long distance recall training and for acclimation to the presence of outboard boats.

Ten dolphins were moved from their concrete tanks to the lagoon pens between August 1966 and February 1969. All exhibited immediate behavioral changes, swam slowly in tight circles at the surface, refused to respond to commands and often refused to eat. The dolphins continued to appear lethargic and unresponsive to the presence of their handlers for from 6-48 hours, after which their behavioral responses gradually returned to previously established levels. For the first few days, some of the dolphins also appeared to experience difficulty locating fish in the turbid water. When these animals swam toward fish thrown into the water, hydrophones often did not pick up echo-location sounds, and the dolphin often passed by without finding the fish. After behavioral responses returned, however, apparent sonar clicks were quite evident, and the dolphin readily found the fish.

Obvious behavioral changes also were evident in other situations, twice when animals escaped from their pens prior to their first release, and twice when animals wandered away from their trainers during the early stages of training in the open lagoon. In all instances the animals exhibited similar behavior. Each swam slowly, primarily on the surface, at a speed estimated to be less than 1 kilometer per hour. Each was found within 3-20 meters of the shoreline in approximately 50-100 centimeters of water. In all instances the dolphins appeared sluggish and unresponsive to their trainers, refused to respond to previously conditioned recall signals and showed only occasional interest in fish thrown near them. Their behavior was similar to that exhibited when they were first moved

Fig. 1. Aerial view of the Marine Bioscience Facility and pontoon pen complex in Mugu Lagoon. Lettering in lower left denotes area where the *T. truncatus* Redeye (R) and the *L. obliquidens* Peanuts (P-1) were found after escaping from the pens. Lettering in top left of picture marks where the *T. truncatus* Fetch (F) and Peanuts (P-2) were found after wandering away during early boat training.

to the lagoon and was reminiscent of sick animals shortly before death in that they appeared physically listless and without their usual food drive. Each dolphin swam in random patterns but stayed close to shore and within approximately 100 meters of the area where it was first located. Even though two of the porpoises had previously been conditioned to swim next to an outboard motor boat, all the animals swam away when a boat approached within 3 meters. None took evasive action if the boat remained farther away.

The animals were returned to their pens in one of two ways. A young female named Fetch (208 centimeter *Tursiops*), who evaded all other capture attempts, was finally recaptured after a handler

jumped on her from a silently drifting boat and dragged her a short distance to the beach where she could be secured in a stretcher for transport to the pens. A young 216 centimeter male *Tursiops* named Redeye readily swam to the side of an older fully trained *Tursiops* brought into the area behind a boat, and subsequently followed closely as the older animal was led back to the pens, whereupon both dolphins entered on command without hesitation.

A young, 220 centimeter male *Lagenorhynchus* named Peanuts wandered away twice. The first time, shortly after being released into the large enclosure, he escaped and swam approximately 100 meters away, along the shore (see Fig. 1). When Peanuts failed to respond to acoustic recall commands, his trainer waded to him and held the unresisting animal while other personnel brought a stretcher. Two weeks later the animal responded normally to recall commands around the perimeter of the pontoon pens. However, after following a boat a short distance he wandered away. This time he was returned to the pens with the same trained *Tursiops* who had been instrumental in returning Redeye.

Discussion

Although conclusive proof is not available, it seems improbable that the observed behavioral changes are correlated with the length of time in captivity. All 10 animals reacted similarly when introduced into the lagoon. Because none would initially respond to any conditioned stimuli, it was impossible to obtain quantitative data for response comparisons. There also seemed to be no obvious correlation between time in captivity and the behavior of the animals that wandered. Fetch, Redeye and Peanuts had been in captivity 8, 14, and 16 months respectively, prior to introduction into the lagoon. Five dolphins had been in captivity for shorter periods, while two had been held for more than 2 years. Only Redeye was thought to have been recently weaned at time of capture.

During training, all were periodically caught and lifted from the tank so that routine blood samples could be taken. Because their behavior always returned to normal within minutes after reentering the water, it seems reasonable to assume that the handling involved in carrying them from their tank to the lagoon did not significantly affect their behavioral responses.

Norris (1965) reported that a *Tursiops gilli* released in Hawaii had to be literally forced out of the pen for the first time and was

initially unwilling to move far away. Our experiences with the release of eight *T. truncatus* and two *L. obliquidens* have been similar to Norris's in that the animals were initially hesitant to leave the pen area. Sometimes they had to be conditioned to leave the area gradually over a period of weeks. Although in some cases, the presence of other animals inside the holding pen complex may have contributed to their reluctance to leave, the same unwillingness was observed with no other dolphins present. After initial release from the pen complex, the animals at Point Mugu were usually worked around the pontoon enclosure for several days or more before being gradually led away from the pens.

The behavior of the dolphins that wandered away from the pen area in the early stages of training appeared similar to that observed when the animals were initially introduced into a lagoon pen. They were lethargic and unresponsive to either their handlers or previously conditioned stimuli. Apparently a sudden change in local environment, such as introduction into the murky and biologically noisy lagoon waters, or entry into a foreign area of the lagoon was significantly upsetting to the animal, and therefore was responsible for the breakdown in responses. Other investigators (Caldwell et al., 1962; Essapian, 1953; McBride and Hebb, 1948) have described behavioral variations due to changes in local environmental stimuli as fear or fright reactions characterized by tight schooling and rapid swimming, apparently a modified flight response. Such observations, however, were made of groups of animals subjected to only occasional and slight environmental variations (i.e. the insertion of an object into the tank) whereas the subject animals at Point Mugu were introduced into markedly new and different surroundings.

Upon returning to the pens, the behavior of all four animals cited in this report rapidly reverted to previously conditioned response levels and they ate readily. Surroundings to which the animal had previously been acclimated provided apparent security, or at least increased the amount of responsiveness that was lacking only a short time before. Animals previously exposed to the lagoon have not exhibited lapses in behavioral responses when reintroduced after an extended stay in the concrete tanks on shore. The conclusion that something familiar can reduce the trauma was also supported by the fact that two of the wayward animals appeared to become more responsive when approached by another dolphin from

the pen complex. In each case, the wandering dolphin was observed to become more alert and active, and returned to the pen close behind the boat which had shortly before caused a mild but consistent avoidance response.

The fact that all four animals entered shallow water and remained there is especially noteworthy. The animals that escaped swam immediately into a nearby shallow area, but the animals that wandered during boat training swam approximately 600 meters through water 3-6 meters deep before moving into the shallows (see Fig. 1). Why both animals were located in approximately the same area on the far side of the lagoon cannot readily be explained. For *T. truncatus* to seek shallow water might be explainable since this species is often found close to shore in areas along the Gulf of Mexico and Florida. However, *L. obliquidens* is a pelagic species of the Pacific Coast and is rarely seen in shallow water, except in isolated cases where sick or injured animals sometimes beach themselves. Members of other cetacean species, *T. truncatus* included, are known to beach themselves when sick (Ray, 1961; Ridgway and Johnson, 1965) and for other unexplained reasons (Kritzler, 1952; Slijper, 1962). The animals cited in this report were in water shallow enough to have been stranded by surf or tidal conditions, or they could have been mistaken for dolphins trying to beach themselves. Consequently, there may prove to be a parallel between the behavior cited here and that of cetaceans which beach themselves in the wild.

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